Temperament of Juvenile Delinquents with History of Substance Abuse

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Background: The etiological factors and interrelations of juvenile delinquents, with psychiatric morbidity and substance abuse have been continuously debated. Cloninger's Tridimensional Theory of Temperament has been reported to predict patterns of substance abuse and comorbidity. In the current study, we aimed to examine the usability of the theory in predicting juvenile delinquency and substance abuse.

Methods: Sixty consecutive and newly incarcerated male delinquents with history of substance abuse were recruited from a juvenile correctional facility in northwestern Taiwan from January 2002 through December 2003. All subjects were assessed of their temperament, behavioral problems, and psychiatric disorders on an individual base.

Results: The juvenile delinquent subjects with childhood history of attention deficit and hyperactivity disorder (ADHD) were significantly younger, consumed less betel nuts, and had more siblings with history of drug abuse.

Conclusion: Consistent with the results of Cloninger's studies, novelty seeking positively correlated to the amount of substance abuse, while harm avoidance inversely correlated in juvenile delinquents. Endemic trend of choice of substance abuse needs to be taken into consideration in future research projects.

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Key words: adolescent, substance abuse, juvenile delinquents, tridimensional personality questionnaire (TPQ).

Substance-abusing juveniles are at especially high risk for psychiatric co-morbidities. However, the etiological factors and interrelations of juvenile delinquency, psychiatric morbidity, and substance abuse continue to be debated.[1-3] Taiwan has experienced a steady increase in substance abuse among adolescents for the past few decades.[4] Juvenile substance abuse using amphetamines accounted for 14.1% of the total number of crimes in Taiwan in 1996, with a steady yearly rise thereafter.[5,6] Thus, it is of great importance to explore possible risk factors linking juvenile delinquency and substance abuse.

Cloninger developed a model of temperament, i.e., the Tridimensional Theory of Temperament, which was collated from biological and psychological research. The model describes characteristic behavioral responses to environmental stimuli along three dimensions, including novelty seeking (NS), harm avoidance (HA), and reward dependence (RD).[7] These dimensions have been reported to predict patterns of substance abuse and comorbidity. For example, an interaction of dimensions on the

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Tridimensional Personality Questionnaire (TPQ) indicated that substance abuse was particularly elevated for persons with a high NS, low HA, and low RD.[8] Further, it has been shown that NS not only predicted early onset of alcohol abuse and criminal behavior in adolescents, but also discriminated alcoholics who exhibited antisocial behaviors from those without antisocial behaviors.[9]

The current study was undertaken to examine the possible uses of Cloninger's temperamental dimensions in a sample of male, juvenile offenders with history of substance abuse. In so doing, we assessed temperament, behavioral problems, and psychiatric disorders in relation to delinquency and substance abuse. The interrelations of these factors were also determined.

METHODS

Subjects

The subjects were recruited from a juvenile correctional facility in northwestern Taiwan, a catchment area with a population of 7 million. Approximately 200 juvenile delinquents are admitted to the medium-security correctional facility annually. The mean length of sentence served in this institution is 1.9 $\pm$ 0.8 years. In the present study, 60 consecutive and newly incarcerated male juveniles with history of substance abuse were recruited from January 2002 through December 2003. All gave informed consent, but one adolescent was transferred to another detention center before the interview was performed. The mean age of the remaining 59 participants was 17.68 $\pm$ 1.45 years (range, 14-20 years). At the time of the interview, the mean amount of education was 7.32 $\pm$ 1.3 years (range, 5-11 years).

This study was approved by the Institutional Review Board of the Chang Gung Memorial Hospital.

Instruments

1. Substance abuse index (SAI)

The SAI is an expert rating instrument for tagging substance abuse history. The participants' lifetime history of substance abuse, including tobacco, alcohol, betel nut, prescription drugs, and illicit drugs, were quantified using a three-level frequency scale (i.e., never, once, and frequent use).

2. Chinese version of the schedule for affective disorders and schizophrenia (CK-SADS)

Psychiatric diagnoses for the subjects were made using the CK-SADS, which is a semi-structured diagnostic interview designed to assess psychiatric disorders in children from 6 to 16 years of age.[10]

3. Tridimensional personality questionnaire (TPQ)

The TPQ is a standardized, 100-item, self-administered true/false instrument that consists of three high-grade dimensions, i.e., NS, HA, and RD. High scores are indicative of an increased incidence of the related behaviors.[8] The Chinese version of the TPQ was prepared via a two-stage translation. The psychometric study revealed satisfactory internal consistency (α = 0.55, 0.70, and 0.87 for RD; NS; and HA, respectively) and acceptable construct validity (goodness-of-fit index = 0.94, adjusted goodness-of-fit index = 0.91, and root mean residual = 0.28).[11] The applicability of the NS and HA subscale of the TPQ is supported by the sound construct validity, although RD had a less value.[12]

Procedures

All subjects were informed about the voluntary and confidential nature of their participation. Subjects were interviewed individually by one of the authors who is an experienced child psychiatrist (Dr. HL C) in a classroom setting, without the presence of institutional staff. A questionnaire was completed after each interview. Finally, subjects were thanked for their participation.

Data analyses

Data analyses focused on examining the relationship among DSM-IV diagnoses and temperament as measured using the TPQ. Descriptive statistics was used to present the demographic data and comorbid disorders of the subjects. Temperament scores of the subjects were examined for any significant differences from normative data by calculating the T-scores using the mean score and standard deviation (SD) of each subscale in the normative data. *T*-scores are defined as multiplying the *z*-score by 10 and adding 50 with a mean of 50 and a standard deviation of 10 (*T*-score = *z*-score *10 + 50). The *t*-test was also conducted to examine the differences between the subjects with and without ADHD.

Correlation analyses with 95% confidence interval were conducted to examine the relationships of quantities of substance abuse, TPQ scores, and clinical data using the Pearson product moment correlation or Kendall correlation, depending on the distribution of the data. Moreover, chi-square test was conducted to examine the relationship between sibling's substance abuse and comorbid ADHD in delinquents with substance abuse. A p value of .05 or less was considered significant.

RESULTS

With respect to the substance abuse history of the subjects and their families, illicit drug use was noted to occur in members of the immediate family, i.e., 10.3% of the subjects' fathers, 1.7% of their mothers, and 1.5% of their siblings. The subjects abused substances from an early age, and as shown in Table 1, cigarettes were the first substance abused (11.1 $\pm$ 2.4), followed by alcohol (12.6 $\pm$ 2.4), betel nut (14.2 $\pm$ 2.7), and amphetamines (15.1 $\pm$ 1.6). Regardless of their age at onset, the most prevalent substance currently abused by these juvenile delinquents was cigarettes (98%, n = 58), followed by amphetamines (96%, n = 57), betel nut (83%, n = 49), alcohol (62%, n = 37), heroin (38%, n = 23), glue (8.4%, n = 5), and marijuana (1.6%, n = 1).

An earlier age of onset of amphetamine use correlated to a larger consumption of betel nuts (r = –0.353, $p < 0.016$).

The subjects were interviewed using the CK-SADS to determine their psychiatric diagnoses. One subject did not have psychiatric diagnosis. Of the remaining subjects, 62% (n = 37) had a diagnosis of ADHD, and of these ADHD cases, 86% (n = 32) also had other co-morbid psychiatric disorders. The psychiatric diagnoses among the juvenile offenders are shown in Table 2.

With respect to their temperament indexed using the TPQ, the mean scores for NS, HA, and RD were 19.06 $\pm$ 3.41, 16.06 $\pm$ 5.52, and 16.93 $\pm$ 3.15, respectively. Table 3 shows the subject's TPQ scores, along with the Taiwanese norm. The juvenile offenders scored higher in NS and HA as well as lower in RD, as compared to the norm. Moreover, their NS, HA, or RD were not related to age at onset of various substance abuse, whereas the quantity of alcohol measured as units per week (i.e., with 1 unit = 8-9 grams alcohol = approximately 12 ounces of beer) positively correlated with age (r = 0.415, $p < 0.003$).

Concerning the possible risk factors linking substance abuse and comorbid psychiatric disorders in juvenile delinquency, the subjects were first divided into two groups. Group 1 consisted of subjects with the diagnosis of ADHD; and subjects of Group 2 did not meet the criteria for ADHD. Then, examination of differences between these two groups was conducted. As shown in Table 4, subjects comorbid with ADHD were significantly younger (t = –2.32, df = 30, $p < 0.027$), consumed significantly fewer betel

Table 1. Age of Onset and Prevalence Rate of Substance Abuse of this Sample

Substance	Mean age of onset (range of years)	Prevalence (N)
Cigarettes	11.1 $\pm$ 2.4 (4-15)	98% (N = 58)
Alcohol	12.6 $\pm$ 2.4 (6-16)	62% (N = 37)
Betel nut	14.2 $\pm$ 2.7 (9-20)	83% (N = 49)
Amphetamines	15.1 $\pm$ 1.6 (11-18)	96% (N = 57)
Glue	15.6 $\pm$ 1.7 (13-17)	8.4% (N = 5)
Heroin	16.4 $\pm$ 2.1 (14-20)	38% (N = 23)
Marijuana	16	1.6% (N = 1)

Table 2. Psychiatric Diagnoses of the 59 Juvenile Delinquent Subjects

Psychiatric diagnosis	Number of subjects
ADHD Group (n = 37)	
ADHD	5
ADHD + Conduct disorder	19
ADHD + Anxiety disorder*	3
ADHD + Depressive disorder	2
ADHD + Tics	1
ADHD + Enuresis	1
ADHD + Depressive disorder + Suicide attempt	1
ADHD + Conduct disorder + Anxiety disorder*	2
ADHD + Conduct disorder + Drug induced psychosis	1
ADHD + Conduct disorder + Depressive disorder	2
Non-ADHD Group (n = 21)	
Conduct disorder	9
Conduct disorder + Anxiety disorder*	9
Conduct disorder + Depressive disorder	1
Conduct disorder + Suicide attempt	1
Anxiety disorder* + Tics	1
No psychiatric diagnosis (n = 1)	1

Abbreviations: Anxiety disorder* includes Generalized anxiety disorder, panic disorder, and phobic disorder.
ADHD: attention deficit and hyperactivity disorder

Table 3. TPQ Scores of the Juvenile Delinquents of this Study and Taiwanese Norm*

Temperament	Juvenile delinquents (n = 59)		Norm of male adolescents* (n = 446)		Z score	T score
	Mean	SD	Mean	SD		
Novelty seeking	19.0	3.4	17.6	4.1	0.341	53.41
Harm avoidance	16.0	5.5	15.6	5.7	0.070	50.70
Reward dependence	16.9	3.1	17.3	3.6	–0.111	48.89

Abbreviations: *Taiwanese male adolescents from randomly selected junior high school students (Kuo et al, 2002).
TPQ: tridimensional personality questionnaire.

Table 4. Differences between Juvenile Delinquents with and without ADHD

	Group 1 (ADHD) n = 37	Group 2 (Non ADHD) n = 21	Statistical examination (t or χ^2 test)
Age (years)	17.37 ± 1.5	18.4 ± 1.3	$p < 0.027$
Novelty seeking	18.1 ± 3.1	19.9 ± 3.4	$p = 0.10$
Harm avoidance	16.6 ± 5.5	15.5 ± 5.0	$p = 0.48$
Reward dependence	17.0 ± 2.8	17.4 ± 3.5	$p = 0.77$
Betel nut consumption	3.34 ± 2.5	5.1 ± 2.3	$p < 0.043$
Sibling with drug abuse	8	0	$p < 0.035$

ADHD: attention deficit and hyperactivity disorder.

nuts (t = –2.13, df = 23.3, $p < 0.043$), and had more siblings with history of drug abuse ($\chi^2 = 5.27$, $p < 0.035$) than subjects without ADHD.

DISCUSSION

In the current study, nicotine and amphetamines were found to be the most commonly abused substances. This is in accordance with the results of a previous study by Yen et al.[13] In the present study, we also found that only the use of alcohol increased significantly with age. However, it is noteworthy in our subjects that the choice of substances they abused changed in accord with aging. More specifically, their consumption of nicotine, betel nuts, and amphetamines decreased when they became older, while alcohol and heroin use increased.

Betel nut chewing is endemic to a subculture among regions in southern China and southeastern Asia. The prevalence of this habit has shown growth in Taiwan, with the prevalence of 0.96% to 16.15% among the adolescent population. Betel nut chewing was considered as a gateway drug to illicit drug use in Taiwan.[14] In this study, we noted that because the age of onset of betel nut use was earlier than amphetamines, it is possible that increasing betel nut use may result in earlier usage of amphetamines.

Results of previous studies have shown that individuals with more symptoms of ADHD and conduct disorders had the highest level of hard drug abuse and dependency.[15,16] However, when our subjects were divided into ADHD and non-ADHD groups, the ADHD group differed from the non-ADHD group only in terms of betel nut use and age rather than other illegal drug abuse. A short range of age distribution of our subjects may account for the different results. Recruiting more subjects with a broader age range may be in order for future studies.

With regard to the temperament of juvenile delinquents, it was shown in this study that NS positively correlated, and HA inversely correlated, to the degree of substance abuse. Although only the amount of nicotine use inversely correlated to HA in this study, the above findings were in accordance with the results of previous studies by Cloninger et al.[1,8] Our findings replicated those in previous studies, suggesting that higher NS behavior among adolescents was related with substance abuse. However, NS failed to predict the age of onset of substance abuse and the severity of antisocial behavior in this study.

Several possible limitations were noted in this study. All of the subjects were male offenders. Thus, the generalization of the findings to female offenders may be limited. The diagnosis of ADHD was made solely on the subject's recall of his childhood, not medical records. The potential of subjective biases in memory needs to be taken cautiously.

Regardless, this is the first study involving incarcerated Taiwanese juvenile male offenders with history of drug abuse, and it is a relatively large, consecutive series of adolescent criminals who were systematically assessed using a structured diagnostic interview. As such, the findings of this study provide

additional information to the medical literature which is needed along this line.

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具物質濫用史的犯罪青少年的氣質

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背 景： 青少年犯罪及物質濫用的原因多年來一直沒有定論。Cloninger 認爲青少年的氣質及精神疾病常與其物質濫用及犯罪有關。本研究的目的在了解台灣地區有物質濫用史的犯罪青少年之氣質及精神疾病與其物質濫用的相關性。

方 法： 研究對象爲 2002 年 1 月至 2003 年 12 月間北台灣某間少年輔育院中連續 60 名有物質濫用經驗的新入院犯罪青少年。在取得個案同意後，於院內教室中完成半結構式精神疾病診斷訪談及自填式問卷填寫。

結 果： 有注意力不足／過動症候群診斷的個案其年齡較輕、使用較少檳榔、手足有藥物濫用情形也較多。

結 論： 以 Cloninger 的 Tridimentional theory 觀點而言，本研究中之個案其氣質分項中與物質濫用量呈正相關的爲尋求神奇，呈負相關的爲逃避傷害。

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關鍵詞： 青少年，物質濫用，青少年犯罪，TPQ。

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